

Amsterdam Road, Sutton Fields Industrial Estate
Hull HU8 0XF Telephone: (0482) 879641
Fax: (0482) 830112 Telex: 592592 Ref: EAL 147

SPECIFICATION

I-SIGHT 20/20

BLISTER PACK INSPECTION SYSTEM

P-1614-S

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1. INTRODUCTION

The I-SIGHT 20/20 Blister Pack Inspection System has been designed to integrate with existing blister packing machines for the inspection of product prior to sealing.

The system uses camera based techniques which have been developed by Electronic Automation Limited and is designed to be mounted on a blister packing machine, located such that the camera can view unsealed blister pockets which contain product. The system can be used to inspect either tablets, capsules or powder.

The system is based on techniques using colour image processing to ensure the quality and correctness of blister packed products.

The I-SIGHT 20/20 system offers the inspection facility for:

Products -

Tablets	:	Round, Oval or Caplets.
Capsules	:	Hard/Soft Gelatin.
Powder	:	Typically White.
Blister Material	:	Aluminium Sheet. Formed Aluminium. Formed plastic - Opaque or Transparent.
Blister Format	:	Any arrangement.
Inspection Criteria	:	Missing Product. Incomplete Product. Incorrect Product, based upon colour and size.

Several products/colours within each pocket may be inspected and the products themselves do not necessarily have to be constrained to a fixed and repeatable position within the pocket. In addition packs which are completely empty of products may be identified and a diverter used to remove these if the blister packing machine supports this facility.

The system operates by viewing the blister web from above, with special illumination in order that the product can be inspected regardless of web material. It is designed to be easy to use with light pen controls, and is compact to facilitate installation. It can be programmed by the operator to inspect product arranged in any format of blister pockets.

This document specifies the system in terms of its description, operation and performance.

2. SYSTEM DESCRIPTION

The system comprises two main component parts in stainless steel enclosures which are connected to form the complete Blister Pack Inspection System:

- Control unit.
- On-line unit.

The complete system is illustrated in Plate 1 and described in the following sections. The overall arrangement is shown schematically in Figure 1 with a block diagram shown in Figure 2.

2.1 Control Unit

The control unit contains all of the hardware and software necessary for the following tasks:

- Inspection of the blister pockets in view.
- Interfacing with the blister packing machine.
- Interfacing with the operator.

An integral monitor and industrial light pen provide the operator interface for control and display of the system operational information.

The compact colour monitor is mounted at an appropriate height for convenient viewing. It is used for the display of the menu control options, data gathered during operation and camera views for ease of setting up.

The light pen provides a number of advantages including operator friendliness and simplicity of use. It is used to 'point' at a displayed option on the screen, whereupon that option is selected. The light pen can be unplugged after the equipment has been set up to provide additional system security.

The control unit contains the following major parts mounted on a telescopic frame for ease of access.

- Power supply unit.
- Card frame containing the printed circuit boards (micro-processor, framestores and serial interface cards).
- Input/Output interfaces with replaceable solid state modules to provide fused optical isolation of input and output signals.
- Monitor and light pen to provide the user interface.

The layout of these parts is shown in Figure 3.

The connectors are mounted at the rear of the unit. These provide all the necessary signals and power connections to interface with the on-line unit.

The components are cooled via two fans which circulate air from the bottom of the unit to the top. One is mounted behind the top filter on the rear panel of the unit. The other is fixed underneath the card frame. There are replaceable filters on the rear of the control unit which are removable from the outside via the two turnbuckle cover securing screws.

Note that mains voltages are present inside this unit and the power should be disconnected before carrying out any maintenance.

2.2 On-line Unit

The on-line unit is mounted onto the blister filling machine in a location as shown in Figure 2. Further detail of the on-line unit is shown in Figure 4. Two standard units are available corresponding to different index lengths of the web.

The unit contains a solid state colour camera fitted with a suitable lens to view the blister web from above. A lighting unit is mounted adjacent to the camera to provide the necessary illumination for a variety of product colours and types. Illumination is continuous for an indexed blister web or stroboscopic for a continuously moving web. In this manner, a clear, unblurred image of the blister web is obtained.

The on-line unit is manufactured from stainless steel and is sealed with easy to clean surfaces to satisfy Good Manufacturing Practice requirements. It is designed to be mounted to the blister packing machine and incorporates a hinged bracket for rapid removal from the blister web in order to facilitate access. Gas struts support the unit in its raised position. The unit is fan cooled or is cooled by a supply of clean and dry compressed air depending on the application.

2.3 Interfacing

Interconnections are made between the controller and on-line unit via armoured flexible conduit cables fitted with multi-pole connectors. Other interfacing to the blister packing machine is made via opto-isolated modules contained within the control unit.

It is necessary to provide an electrical trigger signal to the system to indicate when the blister web to be inspected is in position.

There are up to eight outputs available which may be configured to provide pass or fail (or both) signals corresponding to individual packs under the inspection head. These signals may be delayed by user-programmable shift registers thus providing a flexible means of controlling packs that have been inspected and punched out of the web.

Other interfaces to the blister packing machine include an interlock signal which can be used to prevent operation of the machine unless the inspection system is operating, and an alarm signal which is activated is either a preset percentage or a preset consecutive number of products fail inspection.

3. SYSTEM OPERATION

The system is programmed using the light pen in response to menu options displayed on the monitor. Access to control the system is restricted by the use of a multi-level password system.

The main menu consists of three options - Library, Set Up and Run.

3.1 Library

This option allows the user to manipulate data relating to up to fifty different part settings. Entries in the library are referred to by a name which is entered by the user.

The library holds records of various settings to facilitate a simple changeover from one product type to another. The options available to the user including the following:

- Index, which allows the stored part settings to be viewed.
- Load, which allows a specified setting to be recalled from the library.
- Store, which allows a new or modified setting to be stored in the library.
- Delete, which allows the removal of a specified library entry.
- Reset, which restores the inspection system parameters to their default settings.
- Format, which deletes all library entries from the system.

A new product would typically be set up as described in section 3.2 and the settings saved as a new library entry for future use.

3.2 Setup

This option allows the operator to program all of the inspection parameters for a given product. It includes options to acquire an image, place an inspection window around a blister pack, mark each pocket with a pocket marker and place a sample marker over each product within the pocket (see Figure 5).

Options available to the user include:

- Picture, allowing the acquisition of a camera image.
- Zones, allowing pack, pocket and sample positions, sizes and angles to be defined, manipulated and copied as necessary. Up to 16 packs per inspection cycle may be used.

- Teach, allowing a number of acceptable products to be viewed and a reference of colours and sizes to be generated for use in subsequent inspection.
- Tolerance, allowing an acceptance range to be defined.
- Test, which includes a comprehensive range of facilities allowing a trial run of the system while analysing the inspection operation.
- Options, which includes the facilities needed to set the system up for a given blister packing machine and select the various user-programmable features such as the interlock, alarms, output delays and security access codes.

3.3 Run

This option puts the system into operational mode whereupon it will inspect products in every blister pocket and pack passing beneath the on-line unit. The measured colour and area of each product in every pocket is compared to the references for that pocket. If these are within the set tolerance bands then the pocket is allowed to pass. When punched from the web the individual packs are controlled by the pass or fail signals that were set up when the system was installed and configured. For example these signals may be used to control a diverter or similar device.

When running the system displays the total number of packs inspected and the total number of failed packs, categorised by pack number (1 to 16). If required the colour image seen by the camera may be overlaid onto these statistics with a graphical outline indicating an acceptable pack (green) or a rejected pack (red).

The system can be stopped by selecting the 'STOP' option displayed in run mode. As stated earlier the light pen may be removed if required to avoid unauthorised access to the system.

4. SYSTEM SPECIFICATION

4.1 Inspection Performance

Blister material : Aluminium sheet.
Formed aluminium.
Formed plastic - clear.
Formed plastic - opaque.

Blister format : Any arrangement.

Products -

Tablets : Most shapes including round, oval and caplets.

Capsules : Hard/soft Gelatin with one or more colours.

Powder : Typically white powder.

Blister size range per cycle -

Maximum web width : 280 mm.

Maximum stroke : 210 mm.

Restricted stroke : 110 mm.

System throughput:

This will depend on a number of factors including the size and number of products per inspection and the field of view of the camera (i.e. the total web area to be inspected). As a guide, and assuming the on-line unit corresponding to the maximum stroke is used with an inspection area of 280 mm x 210 mm the following approximation may be made.

If N is the number of pack per inspection

P is the number of (circular) pockets per pack

R is the radius of the pocket in mm

then the time for an inspection, T, is given by:

$$T = N \times P \times (0.44R^2 + 13) \text{ ms}$$

Thus for a single pack containing 15 circular pockets of radius 5 mm the inspection time is 0.4 seconds allowing a throughput of 150 packs per minute.

4.2 General Information

Spatial resolution	:	512 x 512 pixels.
Colour resolution	:	128 levels for each of the red, green and blue components.
Camera type	:	CCD solid state colour.
Inputs	:	10-32V (opto-isolated) for trigger signal. This has a user-selectable shift register delay.
Outputs	:	60V, 3A max (opto-isolated) for pass/reject signals, alarms and interlock. Pass/reject signals have user-selectable shift register delay and duration.
Interfaces	:	RS232 for printer or remote computer as an option.
Display	:	High resolution colour monitor.
Controls	:	Industrial light pen, removable for security.
Control unit dimensions	:	400 mm (w) x 400 mm (d) x 1240 mm (h).
Maximum stroke on-line unit dimensions	:	300 mm (w) x 390 mm (d) x 540 mm (h).
Restricted stroke on-line unit dimensions	:	200 mm (w) x 370 mm (d) x 540 mm (h).
Interconnecting cable length	:	5 m (maximum).
Control unit weight	:	30 kg (approximately).
On-line unit weight	:	15 kg (approximately).
Sealing standards	:	IP40
Operating Temperature	:	5 to 25 degrees centigrade.
Relative Humidity	:	10 to 80% (non-condensing).
Construction	:	Satin finish stainless steel for all external surfaces.
Power requirements	:	240V 50/60 Hz single phase at approximately 2A.

Our policy is one of continual development and we reserve the right to amend the above specification without notice.

5. AVAILABLE OPTIONS

The above specification has described the I-SIGHT 20/20 Blister Pack Inspection System in its standard format. However a number of options are available and these are outlined below. Please contact Electronic Automation Limited for further information.

5.1 Integrated Controller

If required the system controller may be repackaged to locate within the blister packing machine itself. For example the main system components may be rack mounted with the colour monitor attached to a flexible arm for convenient use.

5.2 Custom Designed On-line Unit

Where space is restricted it is usually possible to design a special on-line unit to enable an inspection system to be fitted. Electronic Automation Limited have over ten years experience in carrying out such work and will be able to provide further details on request.

5.3 Additional Interfacing

In addition to standard Pass/Fail signals, alarm and interlock it is possible to provide interfacing to cater for other required functionality. For example this could include a 'system operating' signal from the blister packing machine, a flap diverter to remove empty packs or an inhibit signal to prevent the alarm conditions being tested.

5.4 Remote Data Output/Input

An RS232 serial link may be used for data output to a remote printer or communication with a host computer. The former could include printing inspection results at specified intervals and the latter output of inspection results for statistical analysis or download of job/batch information.

5.5 Multi-lingual User Interface

Systems can be provided which allows the working language to be selected as an option. This has proved useful when operators of different nationalities are using the equipment and this is supported by user manuals in the appropriate language.

5.6 Power Requirements

The supply voltage may be specified at 110V, 50/60 Hz if required.

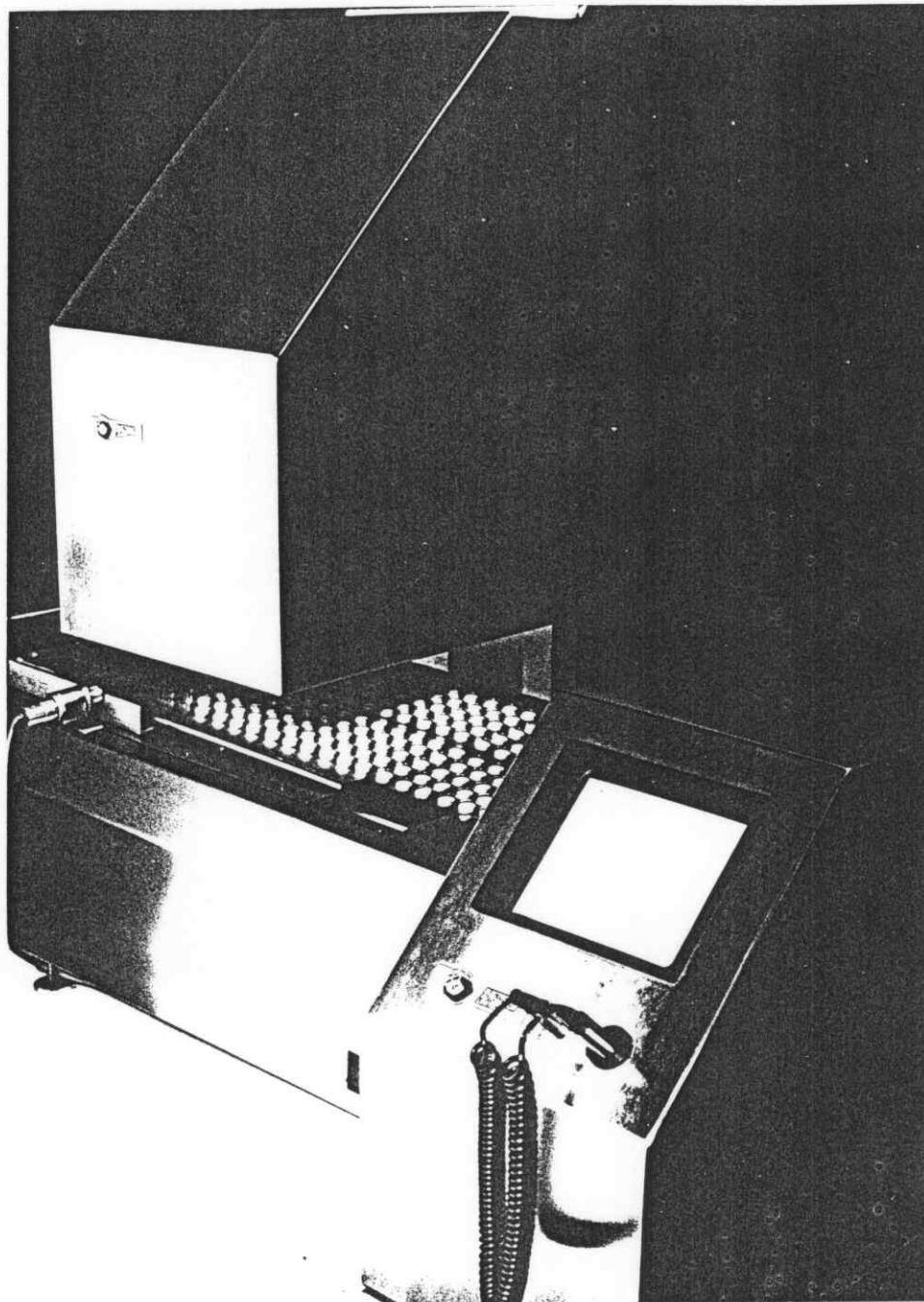


PLATE 1: I-SIGHT 20/20 Blister Pack Inspection System

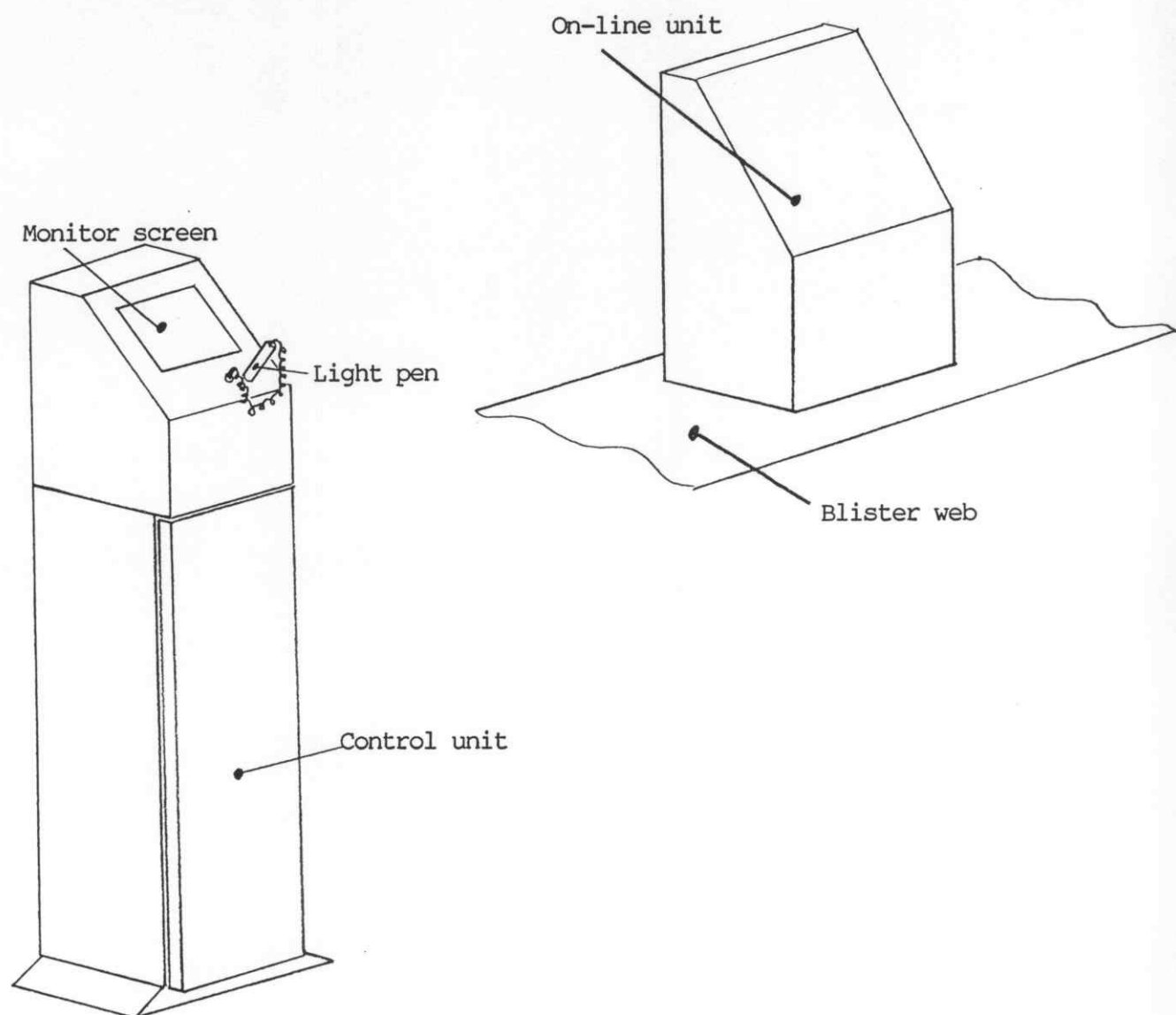


FIGURE 1: I-SIGHT 20/20 Blister Pack Inspection System

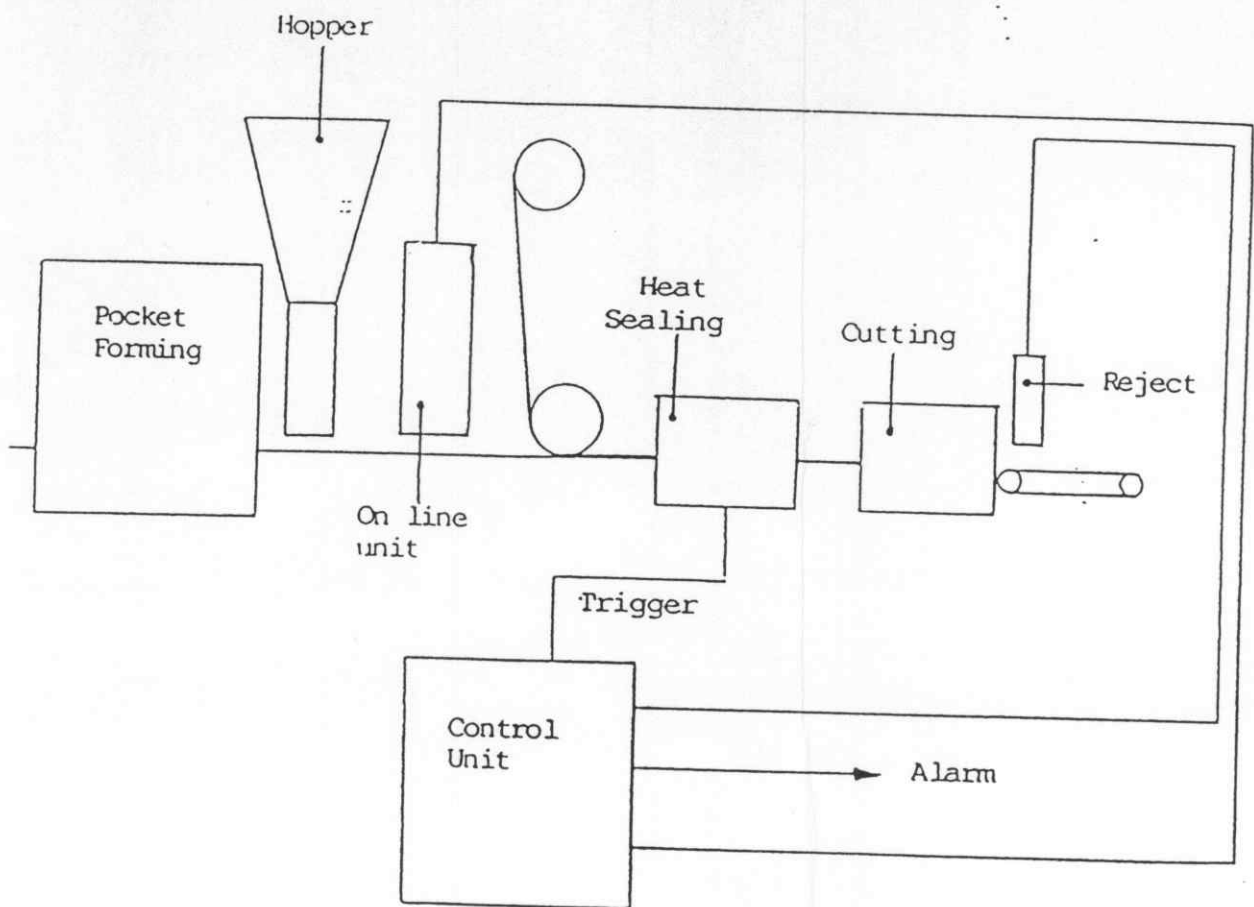


FIGURE 2: System Arrangement

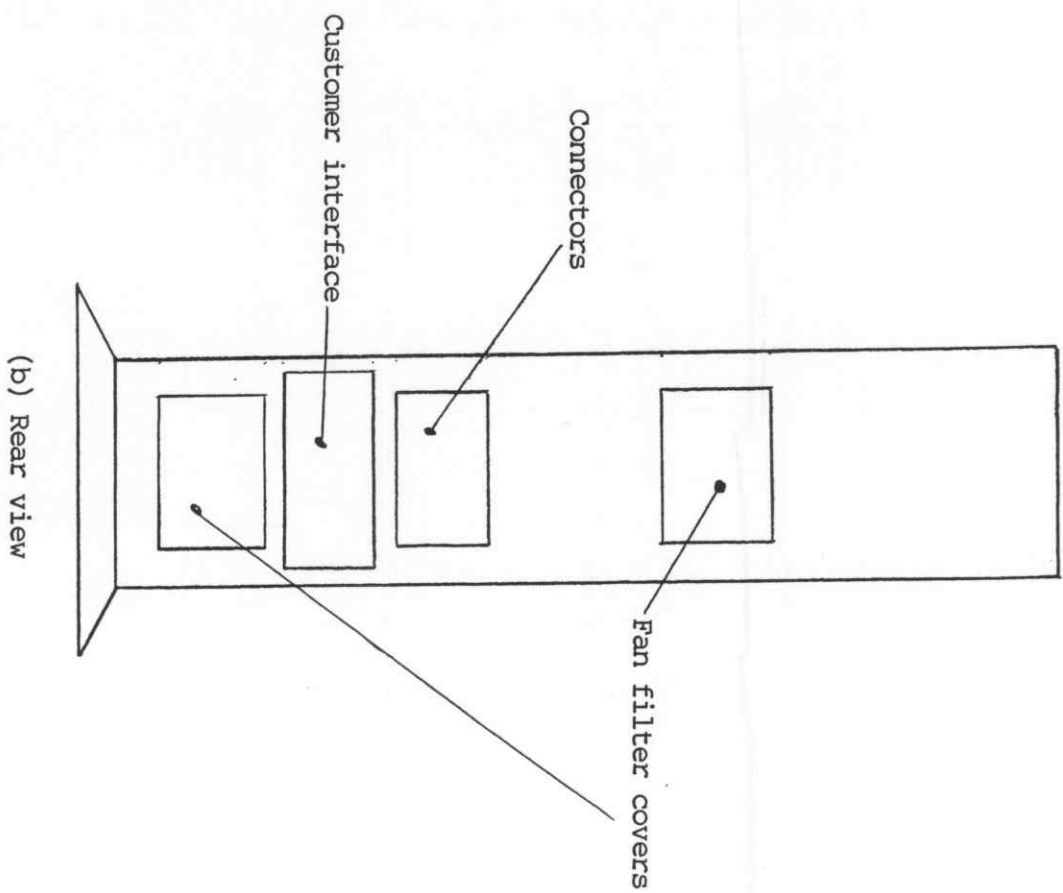
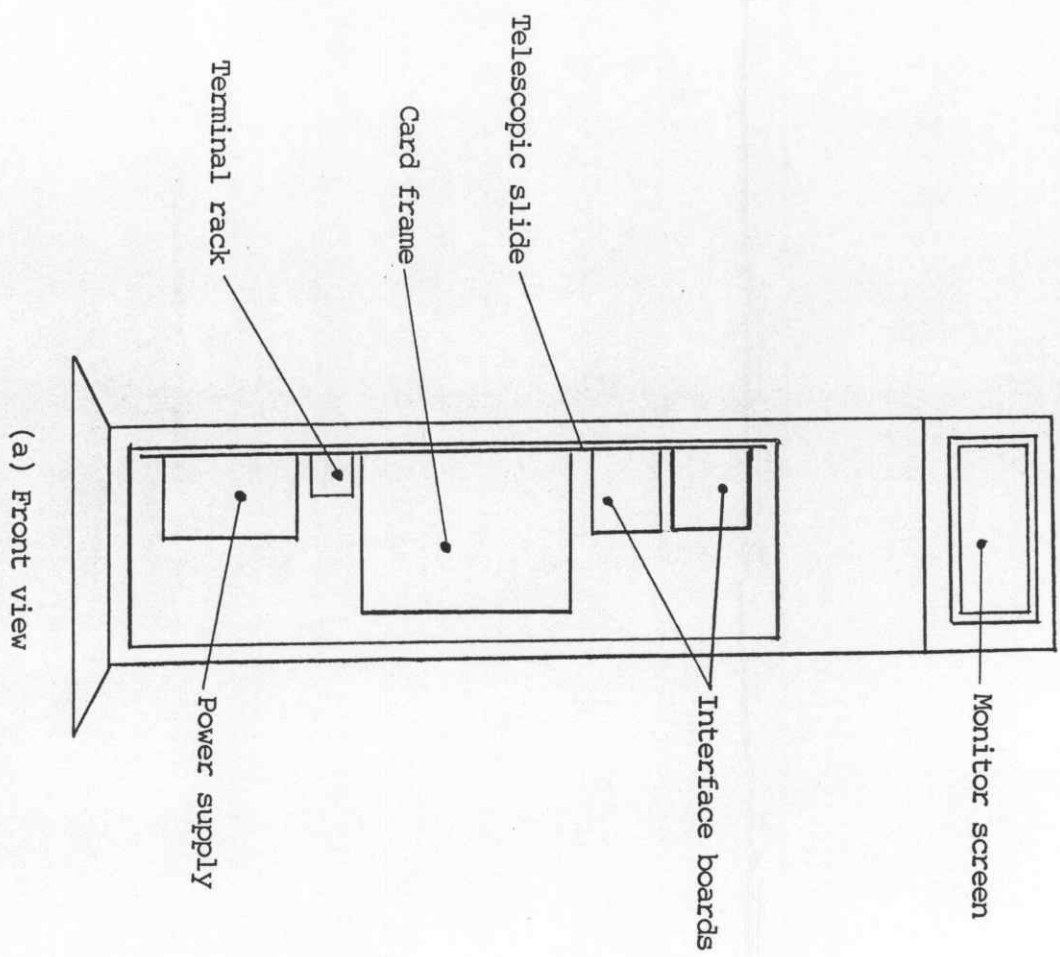


FIGURE 3: Control Unit

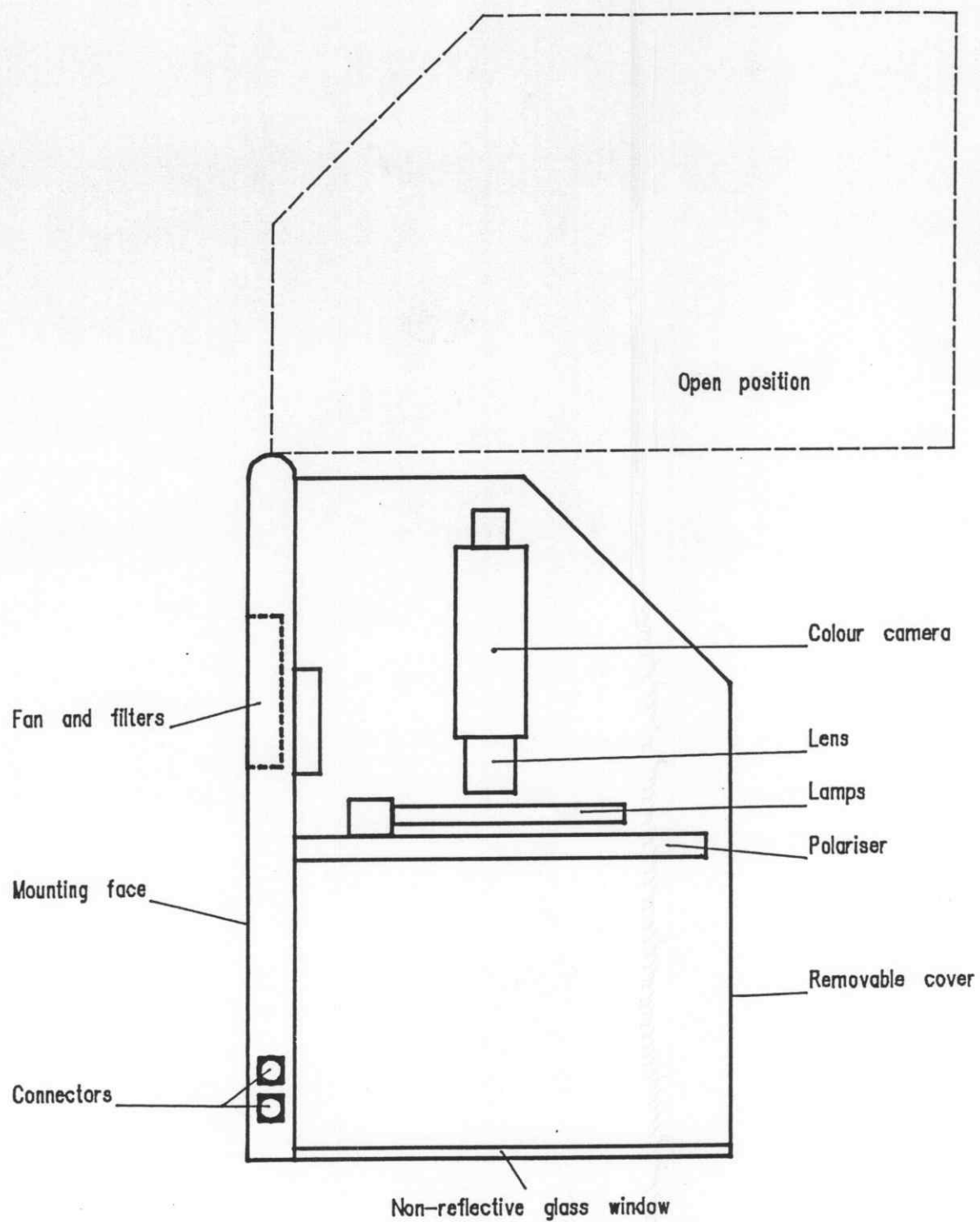


FIGURE 4 : Schematic of On-line Unit

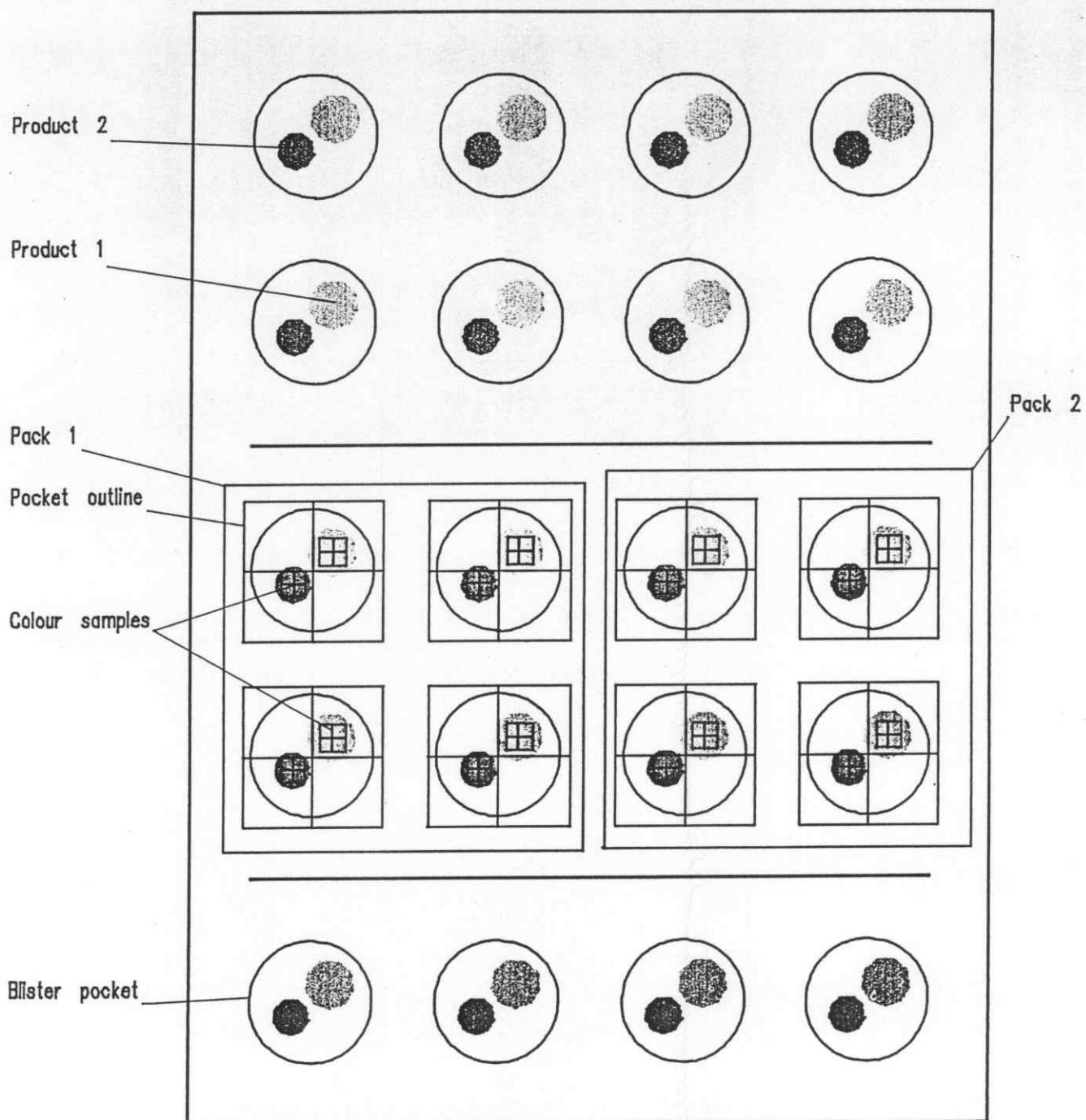


FIGURE 5 : Typical Camera View